IN THE CLAIMS

Claim 1 (Currently Amended): An MIMO communication system comprising:

a transmitter with #1 to #N N (N is an integer equal to or greater than 2) antennas; and

a receiver with #1 to #L L (L is an integer equal to or greater than 2) antennas, in which

said transmitter comprising comprises:

a transmission signal generator for generating a transmission signal;

a signal dividing unit for dividing the transmission signal into #1 to #K K (K is an integer equal to or less than smaller one of N or L) signal streams according to transmission weights derived from feedback information informed from the receiver through a feedback path;

a signal modulator for modulating the #1 to #K K signal streams, respectively; and

a stream processor for dividing respective #1 to #K K modulated signal streams into #1 to #N N substreams and multiplying the #1 to #N N substreams by the #1 to #N N transmission weights, respectively.; and

said receiver comprising:

a channel state estimating means for estimating a state of each communication channel from received signals received by the #1 to #L L antennas to output information of channel state estimation, and including a channel information accumulation unit configured to accumulate the information of channel estimation as information of channel state for a predetermined interval;

a feedback signal generating means for generating feedback information according to the information of channel state estimation;

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a feedback-delay compensating means for processing the feedback

information in order to compensate feedback-delay of the feedback path;

a proper reception weight generating means for generating proper reception

weights by using the information of channel state from the channel information accumulation

unit and the processed feedback information from the feedback-delay compensating means;

a reception weight multiplier for multiplying the received #1 to #L L

substreams of respective #1 to #K K signal streams by the proper #1 to #L L reception

weights, respectively;

a demodulator for composing the #1 to #L L weighted substreams to obtain

respective composed #1 to #K K signal streams and demodulating the composed #1 to #K K

signal streams, respectively; and

a signal combining unit corresponding to the signal dividing unit of the

transmitter for combining the demodulated K signal streams from the demodulator to

reproduce the original transmission signal.

Claim 2 (Currently Amended): A receiver having #1 to #L L (L is an integer equal to

or greater than 2) antennas for an MIMO communication system comprising:

a channel state estimating means for estimating a state of each communication

channel from received signals received by the #1 to #L L antennas to output information of

channel state estimation, and including a channel information accumulation unit configured

to accumulate the information of channel estimation as information of channel state for a

predetermined interval;

a feedback signal generating means for generating feedback information according to

the information of channel state;

a feedback-delay compensating means for processing the feedback information in order to compensate feedback-delay of a feedback path;

a proper reception weight generating means for generating proper reception weights by using the information of channel state <u>from the channel information accumulation unit</u> and processed feedback information from the feedback-delay compensating means;

a reception weight multiplier for multiplying the received ~~#1 to #L~~ <u>L</u> substreams of respective ~~#1 to #K~~ <u>K</u> signal streams (<u>K is an integer equal to or less than smaller one of N or L</u>) by the proper ~~#1 to #L~~ <u>L</u> reception weights, respectively;

a demodulator for composing the ~~#1 to #L~~ <u>L</u> weighted substreams to obtain respective composed ~~#1 to #K~~ <u>K</u> signal streams and demodulating the composed ~~#1 to #K~~ <u>K</u> signal streams, respectively; and

a signal combining unit for combining the demodulated K signal streams from the demodulator to reproduce an original transmission signal.

Claim 3 (Canceled).

Claim 4 (Currently Amended): A receiver according to claim 2, ~~in which~~ <u>wherein</u> the channel state estimating means ~~comprises:~~

~~a channel state estimation unit for estimating state of each communication channel from the received signals received by the #1 to #L antennas and outputting~~ <u>outputs</u> information of channel estimation; ~~and~~

~~a channel information accumulation unit for accumulating the information of channel estimation as the information of channel state for a predetermined interval;~~

the feedback signal generating means comprises:

a transmission weight generator for generating K*N transmission weights based on the information of channel estimation from the channel state estimating means information unit and sending the transmission weights as the feedback information to a transmitter through the feedback path;

the feedback-delay compensating means comprises:

a transmission weight accumulation unit for accumulating the transmission weights for a predetermined interval and outputting the accumulated transmission weights as the processed feedback information; and

~~the proper reception weight generating means comprises:~~

~~a receiving weight generating unit for generating the proper #1 to #L reception weights by using the information of channel state and processed feedback information~~.

Claim 5 (Currently Amended): A receiver according to claim 2, further comprising:

a received power estimation unit for estimating a condition of received power by using the information of channel estimation from the channel state estimating means, received signals received by #1 to #L $\underline{L}$ antennas and information of the known symbol; and

~~the receiver, in which~~

wherein the channel state estimating means comprises:

~~a channel state estimation unit for estimating state of each communication channel from the received signals received by the #1 to #L antennas and~~ outputting outputs information of channel estimation; and

~~a channel information accumulation unit for accumulating the information of channel estimation as the information of channel state for a predetermined interval;~~

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the feedback signal generating means comprises:

a transmission weight generator for generating K*N transmission weights based on the information of channel estimation from the channel state ~~information unit~~ estimating means and sending the transmission weights as the feedback information to a transmitter through the feedback path;

the feedback-delay compensating means comprises:

a transmission weight accumulation unit for accumulating the transmission weights for a predetermined interval and outputting the accumulated transmission weights as the processed feedback information; and

the proper reception weight generating means comprises:

a first reception weight generator for generating K*L first reception weights by using the information of channel estimation from the channel state estimating means ~~information unit~~ and processed feedback information from the transmission weight accumulation unit;

a second reception weight generator for generating K*L second reception weights by using the information of channel state from the channel information accumulation unit and processed feedback information from the transmission weight accumulation unit; and

a weight selector for estimating a transmission quality according to the first reception weights, second reception weights, processed feedback information, information of channel state and condition of received power from the received power estimation unit, and selecting the proper reception weights.

Claim 6 (Currently Amended): A receiver according to claim 2, further comprising:

a received power estimation unit for estimating a condition of received power by using the information of channel estimation from the channel state estimating means, received signals received by #1 to #L L antennas and information of [[the]] a known symbol; and

the receiver, in which

wherein the channel state estimating means comprises:

a channel state estimation unit for estimating state of each communication channel from the received signals received by the #1 to #L antennas and outputting the information of channel estimation;

a channel information accumulation unit for accumulating the information of channel estimation for a predetermined interval; and includes a channel information selector for selecting channel information to be used as the information of channel state for generating K*L proper reception weights according to the information of channel estimation from the channel state estimating means estimating unit, accumulated information of channel estimation in the channel information accumulation unit and condition of received power as well as given information of communication capacity, information of delay time of the communication channel and information of Doppler frequency;

the feedback signal generating means comprises:

a transmission weight generator for generating K*N transmission weights based on the information of channel estimation from the channel state estimating means information unit and sending the transmission weights as the feedback information to a transmitter through the feedback path;

the feedback-delay compensating means comprises:

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a transmission weight accumulation unit for accumulating the transmission weights for a predetermined interval and outputting the accumulated transmission weights as the processed feedback information; and

the proper reception weight generating means comprises:

a reception weight generator for generating K*L reception weights by using the selected channel information from the channel information selector and processed feedback information from the transmission weight accumulation unit.

Claim 7 (Currently Amended): A receiver according to claim 2, ~~in which~~ wherein the channel state estimating means ~~comprises:~~

~~a channel state estimation unit for estimating state of each communication channel from the received signals received by the #1 to #L antennas and outputting~~ outputs information of channel estimation[[;]] and includes:

a channel information storage for storing past information of channel estimation which has been outputted from the channel state estimating means ~~estimation unit~~; and

a channel information adjusting unit for adjusting the information of channel estimation according to given information of time delay of the communication channel and the past information of channel estimation stored in the channel information storage and outputting adjusted information of channel estimation; ~~and~~

~~a channel information accumulation unit for accumulating the adjusted information of channel estimation as the information of channel state for a predetermined interval;~~

the feedback signal generating means comprises:

a transmission weight generator for generating K*N transmission weights

based on the adjusted information of channel estimation from the channel information

adjusting unit and sending the transmission weights as the feedback information to a

transmitter through the feedback path; and

the feedback-delay compensating means comprises:

a transmission weight accumulation unit for accumulating the transmission

weights as the processed feedback information for a predetermined interval.

Claim 8 (Currently Amended): A receiver according to claim 2, further comprising:

a received power estimation unit for estimating a condition of received power by

using the information of channel estimation from the channel state estimating means,

received signals received by #1 to #L L antennas and information of [[the]] a known symbol;

and

the receiver, in which

wherein the channel state estimating means comprises:

a channel state estimation unit for estimating state of each communication

channel from the received signals received by the #1 to #L antennas and outputting outputs

information of channel estimation[[;]], and includes:

a channel information storage for storing past information of channel

estimation which has been outputted from the channel state estimating means estimation unit;

and

a channel information adjusting unit for adjusting the information of channel

estimation according to given information of time delay and the past information of channel

estimation stored in the channel information storage and outputting adjusted information of

channel estimation; and

~~a channel information accumulation unit for accumulating the adjusted information of channel estimation as the information of channel state for a predetermined interval;~~

the feedback information generating means comprises:

a transmission weight generator for generating K*N transmission weights based on the adjusted information of channel estimation from the channel information adjusting unit and sending the transmission weights as the feedback information to a transmitter through the feedback path;

the feedback-delay compensating means comprises:

a transmission weight accumulation unit for accumulating the transmission weights as the processed feedback information for a predetermined interval; and

the proper reception weight generating means comprises:

a first reception weight generator for generating K*L first reception weights by using the adjusted information of channel estimation from the channel information adjusting unit and processed feedback information from the transmission weight accumulation unit;

a second reception weight generator for generating K*L second reception weights by using the information of channel state from the channel information accumulation unit and processed feedback information from the transmission weight accumulation unit; and

a weight selector for estimating a transmission quality according to the first reception weights, second reception weights, processed feedback information, adjusted information of channel estimation and condition of received power, and selecting reception weights to be used as the proper reception weights <u>from the first or the second reception weights</u>.

Claim 9 (Currently Amended): A receiver according to claim 2, further comprising:

a received power estimation unit for estimating a condition of received power by using the information of channel estimation from the channel state estimating means, received signals received by #1 to #L L antennas and information of the known symbol; and the receiver, in which

wherein the channel state estimating means comprises:

a channel state estimation unit for estimating state of each communication channel from the received signals received by the #1 to #L antennas and outputting information of channel estimation; includes:

a channel information storage for storing past information of channel estimation which has been outputted from the channel state estimating means estimation unit;

a channel information adjusting unit for adjusting the information of channel estimation according to given information of time delay and the past information of channel estimation stored in the channel information storage and outputting adjusted information of channel estimation;

a channel information accumulation unit for accumulating the adjusted information of channel estimation for a predetermined interval; and

a channel information selector for selecting channel information as the information of channel state to be used for generation of the proper reception weights according to the adjusted information of channel estimation, adjusted and accumulated information of channel estimation in the channel information accumulation unit and condition of received power as well as given information of communication capacity, information of delay time of the communication channel and information of Doppler frequency;

the feedback information generating means comprises:

a transmission weight generator for generating K*N transmission weights

based on the adjusted information of channel estimation from the channel information

adjusting unit and sending the transmission weights as the feedback information to a

transmitter through the feedback path;

the feedback-delay compensating means comprises:

a transmission weight accumulation unit for accumulating the transmission

weights as the processed feedback information for a predetermined interval; and

the proper reception weight generating means comprises:

a reception weight generator for generating K*L reception weights by using

the information of channel state from the channel information selector and processed

feedback information from the transmission weight accumulation unit.

Claims 10-11 (Canceled).

Claim 12 (Currently Amended): An MIMO communication system comprising:

a transmitter with #1 to #N N (N is an integer equal to or greater than 2) antennas; and

a receiver with #1 to #L L (L is an integer equal to or greater than 2) antennas, in which

said transmitter comprising comprises:

a transmission signal generator for generating a transmission signal;

a sender-side transmission weight generator for generating K*N sender-side

transmission weights based on feedback information from the receiver through a feedback

path;

a signal dividing unit for dividing the transmission signal into #1 to #K K (K

is an integer equal to or less than smaller one of N or L) signal streams according to the

sender-side transmission weights;

a signal modulator for modulating the ~~#1 to #K~~ K signal streams, respectively; and

a stream processor for dividing respective ~~#1 to #K~~ K modulated signal streams into ~~#1 to #N~~ N substreams and multiplying the ~~#1 to #N~~ N substreams by the sender-side ~~#1 to #N~~ N transmission weights, respectively; and

said receiver comprising:

a feedback information generating means for generating primitive feedback information from received ~~#1 to #L~~ L substreams received by the ~~#1 to #L~~ L antennas of the receiver, and including a channel state estimation unit for estimating a state of each communication channel from the received signals received by the L antennas to obtain information of channel estimation as the primitive feedback information;

a feedback-delay processing means for adjusting the primitive feedback information to obtain feedback information and sending the feedback information to the transmitter through the feedback path;

a feedback-delay compensating means for compensating a feedback-delay for the feedback information from the feedback-delay processing means, and including a channel information accumulation unit for accumulating the primitive feedback information from the channel state estimation unit;

a proper reception weight generating means for generating K*L proper reception weights by using the compensated feedback information from the feedback-delay compensating means;

a reception weight multiplier for multiplying the received ~~#1 to #L~~ L substreams of respective ~~#1 to #K~~ K signal streams by the proper ~~#1 to #L~~ L reception weights, respectively;

a demodulator for composing the #1 to #L L weighted substreams to obtain

respective composed #1 to #K K signal streams and demodulating the composed #1 to #K K

signal streams, respectively; and

a signal combining unit corresponding to the signal dividing unit of the

transmitter for combining the demodulated K signal streams from the demodulator to

reproduce the original transmission signal.

Claim 13 (Currently Amended): A receiver with #1 to #L L (L is an integer equal to

or greater than 2) antennas in an MIMO communication system comprising:

a feedback information generating means for generating primitive feedback

information from received #1 to #L L substreams received by the #1 to #L L antennas of the

receiver, and including a channel state estimation unit for estimating a state of each

communication channel from the received signals received by the L antennas to obtain

information of channel estimation as the primitive feedback information;

a feedback-delay processing means for adjusting the primitive feedback information

to obtain feedback information and sending the feedback information to a transmitter through

a feedback path;

a feedback-delay compensating means for compensating a feedback-delay for the

feedback information from the feedback-delay processing means, and including a channel

information accumulation unit for accumulating the primitive feedback information from the

channel state estimation unit;

a proper reception weight generating means for generating K*L proper reception

weights by using the feedback-delay compensated feedback information from the feedback-

delay compensating means;

a reception weight multiplier for multiplying the received #1 to #L L substreams of

respective #1 to #K K signal streams by the proper #1 to #L L reception weights,

respectively;

a demodulator for composing the #1 to #L L weighted substreams to obtain respective

composed #1 to #K K signal streams and demodulating the composed #1 to #K K signal

streams, respectively; and

a signal combining unit for combining the demodulated K signal streams from the

demodulator to reproduce an original transmission signal.

Claim 14 (Currently Amended): A receiver according to claim 13, in which

the feedback information generating means comprises:

[[a]] wherein the channel state estimation unit for estimating state of each

communication channel from the received signals received by the #1 to #L L antennas to

obtain information of channel estimation as the primitive feedback information; whereby the

channel state estimating unit also works as the feedback-delay processing means for sending

the primitive feedback information as the feedback information to the transmitter through the

feedback path and to the feedback-delay compensating means;

the feedback-delay compensating means comprises:

a channel information accumulation unit for accumulating the feedback

information from the channel state estimation unit; and

a receiver-side transmission weight generator for generating K*N receiver-

side transmission weights as the feedback-delay compensated feedback information based on

the accumulated primitive feedback information from the channel information accumulation

unit; and

the proper reception weight generating means comprises:

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a reception weight generator for generating K*L proper reception weights by using the accumulated <u>primitive</u> feedback information from the channel information accumulation unit and the feedback-delay compensated feedback information from the transmission weight generator.

Claim 15 (Currently Amended): A receiver according to claim 13, further comprising:

a received power estimation unit for estimating a condition of received power by using information of channel estimation, received signals received by #1 to #L <u>L</u> antennas and information of the known symbol; ~~and~~

~~the receiver in which~~

~~the feedback information generating means comprises:~~

~~a channel state estimation unit for estimating state of each communication channel from the received signals received by the #1 to #L antennas to obtain the information of channel estimation as the primitive feedback information; whereby~~ wherein the channel state estimating unit also works as the feedback-delay processing means for sending the primitive feedback information as the feedback information to the transmitter through the feedback path and to the feedback-delay compensating means;

the feedback-delay compensating means comprises:

~~a channel information accumulation unit for accumulating the primitive feedback information from the channel state estimation unit; and~~

a receiver-side transmission weight generator for generating K*N receiver-side transmission weights as the feedback-delay compensated feedback information based on the accumulated <u>primitive</u> feedback information from the channel information accumulation unit; and

the proper reception weight generating means comprises:

a first reception weight generator for generating K*L first reception weights by using the information of channel estimation from the channel state estimation unit and the feedback-delay compensated feedback information from the transmission weight generator;

a second reception weight generator for generating K*L second reception weights by using the accumulated primitive feedback information from the channel information accumulation unit and the receiver-side transmission weights from the transmission weight generator; and

a weight selector for estimating a transmission quality according to the first reception weights, second reception weights, receiver-side transmission weights, information of channel estimation and condition of received power, and selecting the proper reception weights from the first or second reception weights.

Claim 16 (Currently Amended): A receiver according to claim 13, further comprising:

a received power estimation unit for estimating a condition of received power by using the information of channel estimation from the channel state estimating means, received signals received by #1 to #L L antennas and information of the known symbol; and

the receiver, in which

the feedback information generating means comprises:

a channel state estimation unit for estimating state of each communication channel from the received signals received by the #1 to #L antennas to obtain the information of channel estimation as the primitive feedback information; whereby wherein the channel state estimating [[unit]] means also works as the feedback-delay processing means for

sending the primitive feedback information as the feedback information to the transmitter

through the feedback path and to the feedback-delay compensating means;

the feedback-delay compensating means comprises:

~~a channel information accumulation unit for accumulating the primitive~~

~~feedback information from the channel state estimation unit; and~~

a receiver-side transmission weight generator for generating K*N receiver-

side transmission weights as the feedback-delay compensated feedback information based on

the accumulated <u>primitive</u> feedback information from the channel information accumulation

unit; and

the proper reception weight generating means comprises:

a channel information selector for selecting channel information to be used for

generation of K*L proper reception weights according to the information of channel

estimation, accumulated information of channel estimation in the channel information

accumulation unit and condition of received power as well as given information of

communication capacity, information of delay time and information of Doppler frequency;

and

a reception weight generator for generating K*L proper reception weights by

using the selected channel information from the channel information selector and the

feedback-delay compensated feedback information from the receiver-side transmission

weight accumulation unit.

Claim 17 (Currently Amended): A receiver according to claim 13, ~~in which~~

~~the feedback information generating means comprises:~~

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~~a channel state estimation unit for estimating state of each communication channel from the received signals received by the #1 to #L~~ L ~~antennas and outputting information of channel estimation as the primitive feedback information;~~

wherein the feedback information processing means comprises:

a channel information storage for storing past information of channel estimation which has been outputted from the channel state estimation unit;

a channel information adjusting unit for adjusting the information of channel estimation according to given information of time delay and the past information of channel estimation stored in the channel information storage and sending the adjusted information of channel estimation as the feedback information to a transmitter through a feedback path ~~and to the feedback-delay compensating means~~; [[and]]

wherein the channel information accumulation unit accumulates the adjusted information of channel estimation from the channel information adjusting unit for a predetermined interval;

the feedback-delay compensating means comprises:

~~a channel information accumulation unit for accumulating the adjusted information of channel estimation from the channel information adjusting unit for a predetermined interval;~~

a receiver-side transmission weight generator for generating K*N receiver-side transmission weights based on the adjusted and accumulated information of channel estimation in the channel information accumulation unit;

a transmission weight accumulation unit for accumulating the receiver-side transmission weights from the receiver-side transmission weight generator for a predetermined interval and outputting the receiver-side transmission weights as the feedback-

delay compensated feedback information to the proper reception weight generating means;

and

the proper reception weight generating means comprises:

a reception weight generator for generating the proper #1 to #L L reception

weights by using the adjusted and accumulated feedback information of channel estimation

from the channel information accumulation unit and the feedback-delay compensated

feedback information from the transmission weight generator.

Claim 18 (Currently Amended): A receiver according to claim 13, further

comprising:

a received power estimation unit for estimating a condition of received power by

using the information of channel estimation, received signals received by the #1 to #L L

antennas and information of the known symbol; and

the receiver, in which

the feedback information generating means comprises:

a channel state estimation unit for estimating state of each communication

channel from the received signals received by the #1 to #L antennas to obtain information of

channel estimation as the primitive feedback information;

wherein the feedback information processing means comprises:

a channel information storage for storing past information of channel

estimation which has been outputted from the channel state estimation unit; and

a channel information adjusting unit for adjusting the information of channel

estimation according to given information of time delay and the past information of channel

estimation stored in the channel information storage and sending the adjusted information of

channel estimation as the feedback information to the transmitter through the feedback path;

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~~the feedback-delay compensating means comprises:~~

[[a]] wherein the channel information accumulation unit ~~for accumulating~~ accumulates the adjusted information of channel estimation from the channel information adjusting unit for a predetermined interval;

the feedback-delay compensating means comprises:

a receiver-side transmission weight generator for generating K*N receiver-side transmission weights based on the adjusted and accumulated information of channel estimation in the channel information accumulation unit; and

a transmission weight accumulation unit for accumulating the receiver-side transmission weights from the receiver-side transmission weight generator for a predetermined interval as the feedback-delay compensated feedback information; and

the proper reception weight generating means comprises:

a first reception weight generator for generating K*L first reception weights by using the adjusted information of channel estimation from the channel state estimation unit and the feedback-delay compensated feedback information from the transmission weight accumulation unit;

a second reception weight generator for generating K*L second reception weights by using the adjusted and accumulated information of channel estimation in the channel information accumulation unit and the feedback-delay compensated feedback information from the transmission weight accumulation unit; and

a weight selector for estimating a transmission quality according to the first reception weights, second reception weights, feedback-delay compensated feedback information, adjusted information of channel estimation from the channel information adjusting unit and condition of received power, and selecting the proper reception weights from the first or the second reception weights.

Claim 19 (Currently Amended): A receiver according to claim 13, further comprising:

a received power estimation unit for estimating a condition of received power by using the information of channel estimation, received signals received by the #1 to #L L antennas and information of the known symbol; and

the receiver, in which

the feedback information generating means comprises:

a channel state estimation unit for estimating state of each communication channel from the received signals received by the #1 to #L antennas to obtain information of channel estimation as the primitive feedback information;

wherein the feedback information processing means comprises:

a channel information storage for storing past information of channel estimation which has been outputted from the channel state estimation unit;

a channel information adjusting unit for adjusting the information of channel estimation according to given information of time delay of the communication channel and the past information of channel estimation stored in the channel information storage and sending the adjusted information of channel estimation as the feedback information to the transmitter through the feedback path;

the feedback-delay compensating means comprises:

wherein [[a]] the channel information accumulation unit for accumulating accumulates the adjusted information of channel estimation from the channel information adjusting unit for a predetermined interval;

the feedback-delay compensating means comprises:

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a receiver-side transmission weight generator for generating K*N receiver-side transmission weights based on the adjusted and accumulated information of channel estimation in the channel information accumulation unit; and

a transmission weight accumulation unit for accumulating the receiver-side transmission weights from the receiver-side transmission weight generator for a predetermined interval as the feedback-delay compensated feedback information; and

the proper reception weight generating means comprises:

a channel information selector for selecting channel information to be used for generation of K*L proper reception weights according to the adjusted information of channel estimation, adjusted and accumulated information of channel estimation in the channel information accumulation unit and condition of received power as well as given information of communication capacity, information of delay time of the communication channel and information of Doppler frequency; and

a reception weight generator for generating K*L proper reception weights by using the selected channel information from the channel information selector and the feedback-delay compensated feedback information from the receiver-side transmission weight accumulation unit.

Claim 20 (Currently Amended): A receiver according to claim 13, in which the feedback information generating means comprises:

a channel state estimation unit for estimating state of each communication channel from the received signals received by the #1 to #L antennas to obtain information of channel estimation as the primitive feedback information;

wherein the feedback information processing means comprises:

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a channel information storage for storing past information of channel

estimation which has been generated by the channel state estimation unit; and

a channel information adjusting unit for adjusting the information of channel

estimation according to the past information of channel estimation stored in the channel

information storage and given information of time delay and sending the adjusted channel

information as the feedback information to the transmitter through the feedback path;

~~the feedback-delay compensating means comprises:~~

[[a]] wherein the channel information accumulation unit ~~for accumulating~~

accumulates the adjusted channel information from the channel information adjusting unit for

a predetermined interval; ~~and~~

the feedback-delay compensating means comprises:

a receiver-side transmission weight generator for generating K*N receiver-

side transmission weights as the feedback-delay compensated feedback information by using

the adjusted and accumulated channel information in the channel information accumulation

unit; and

the proper reception weight generating means comprises:

a reception weight generator for generating K*L proper reception weights by

using the information of channel estimation from the channel state estimation unit and the

feedback-delay compensated feedback information.

Claims 21-22 (Canceled).

Claim 23 (Currently Amended): A method of receiving and reproducing MIMO transmission signal comprising ~~the steps of~~:

~~(a) step of~~ estimating a state of each communication channel from [[the]] received signals received by ~~#1 to #L~~ L antennas of an MIMO receiver to obtain and output information of channel estimation as information of channel state;

accumulating the information of channel estimation as the information of channel state for a predetermined interval;

~~(b) step of~~ generating feedback information according to the information of channel state;

~~(c) step of~~ sending the feedback information to a transmitter through a feedback path;

~~(d) step of~~ processing the feedback information in order to compensate feedback-delay of a feedback path;

~~(e) step of~~ generating K*L proper reception weights by using the information of channel state and processed feedback information;

~~(f) step of~~ multiplying the received ~~#1 to #L~~ L substreams of respective ~~#1 to #K~~ K signal streams by the proper ~~#1 to #L~~ L reception weights, respectively;

~~(g) step of~~ composing the ~~#1 to #L~~ L weighted substreams to obtain respective composed ~~#1 to #K~~ K signal streams;

~~(h) step of~~ demodulating the composed ~~#1 to #K~~ K signal streams, respectively; and

~~(i) step of~~ combining the demodulated K signal streams to reproduce an original transmission signal.

Claim 24 (Currently Amended): A method of receiving and reproducing MIMO transmission signal according to claim 23, ~~in which~~

~~(a) step includes:~~

~~(a1) step of estimating state of each communication channel from the received signals received by the #1 to #L antennas and outputting information of channel estimation as the information of channel state;~~

~~(b) step includes:~~

~~(b1) step of~~ <u>wherein the generating the feedback information includes</u> generating K*N transmission weights based on the information of channel estimation;

~~(c) step includes:~~

~~(c1) step of~~ <u>the sending the feedback information includes</u> sending the transmission weights as the feedback information to the transmitter through the feedback path;

~~(d) step includes:~~

~~(d1) step of~~ <u>the processing the feedback information includes</u> accumulating the transmission weights as the processed feedback information for a predetermined interval~~; and~~

~~(e) step includes:~~

~~(e1) step of generating K*L proper reception weights by using the information of channel state and processed feedback information.~~

Claim 25 (Currently Amended): A method of receiving and reproducing MIMO transmission signal according to claim 23, ~~in which~~

~~(a) step includes:~~

~~(a1) step of estimating state of each communication channel from the received signals received by the #1 to #L antennas and outputting information of channel estimation; and~~

~~(a2) step of accumulating the information of channel estimation as the information of channel state for a predetermined interval;~~

(b) step includes:

———— (b1) step of wherein the generating the feedback information includes

generating K*N transmission weights based on the information of channel estimation;

(c) step includes:

———— (c1) step of the sending the feedback information includes sending the

transmission weights as the feedback information to the transmitter through the feedback

path; and

(d) step includes:

———— (d1) step of the processing the feedback information includes accumulating the

transmission weights as the processed feedback information for a predetermined interval; and

(e) step includes:

———— (e1) step of generating K*L proper #1 to #L L reception weights by using the

information of channel state and processed feedback information.

Claim 26 (Currently Amended): A method of receiving and reproducing MIMO

transmission signal according to claim 23, further comprising the step of:

(j) step of estimating a condition of received power by using information of channel

estimation, received signals received by #1 to #L L antennas and information of a known

symbol; and

the method, in which

(a) step includes:

———— (a1) step of estimating state of each communication channel from the received

signals received by the #1 to #L antennas to obtain information of channel estimation; and

———— (a2) step of accumulating the information of channel estimation as the

information of channel state for a predetermined interval;

(b) step includes:

———(b1) step of wherein the generating the feedback information includes generating K*N transmission weights as the feedback information based on the information of channel estimation;

(d) step includes:

———(d1) step of the processing the feedback information includes accumulating the transmission weights as the processed feedback information for a predetermined interval; and

(e) step includes:

———(e1) step of the generating K*L proper reception weights includes:

generating K*L first reception weights by using the information of channel estimation and processed feedback information;

(e2) step of generating K*L second reception weights by using the information of channel state and processed feedback information;

(e3) step of estimating a transmission quality according to the first reception weights, second reception weights, processed feedback information, information of channel state and condition of received power; and

(e4) step of selecting the proper reception weights from the first or the second reception weights.

Claim 27 (Currently Amended): A method of receiving and reproducing an MIMO transmission signal according to claim 23, further comprising the step of:

(j) step of estimating a condition of received power by using the information of channel estimation, received signals received by #1 to #L L antennas and information of a known symbol; and

the method, in which

~~(a) step includes:~~

~~(a1) step of estimating state of each communication channel from the received signals received by the #1 to #L~~ L antennas ~~to obtain the information of channel estimation;~~

~~(a2) step of accumulating the information of channel estimation for a predetermined interval to obtain accumulated information of channel estimation; and~~

~~(a3) step of~~ wherein the estimating a state of each communication channel includes selecting channel information to be used as the information of channel state for generation of the proper ~~#1 to #L~~ L reception weights according to the information of channel estimation, accumulated information of channel estimation and condition of received power as well as given information of communication capacity, information of delay time of the communication channel and information of Doppler frequency;

~~(b) step includes:~~

~~(b1) step of~~ the generating the feedback information includes generating K*N transmission weights based on the information of channel estimation;

~~(c) step includes:~~

~~(c1) step of~~ the sending the feedback information includes sending the transmission weights as the feedback information to the transmitter through the feedback path; and

~~(d) step includes:~~

~~(d1) step of~~ the processing the feedback information includes accumulating the transmission weights for a predetermined interval to obtain accumulated transmission weights as the processed feedback information~~; and~~

~~(e) step includes:~~

~~(e1) step of generating K*L reception weights by using the selected channel information and processed feedback information.~~

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Claim 28 (Currently Amended): A method of receiving and reproducing MIMO

transcription signal according to claim 23, ~~in which~~

~~(a) step includes:~~

~~(a1) step of estimating state of each communication channel from the received~~

~~signals received by the #1 to #L antennas to obtain information of channel estimation;~~

~~(a2) step of~~ wherein the estimating a state of each communication channel

includes:

storing past information of channel estimation ~~which has been obtained by~~

~~(a1) step~~;

~~(a3) step of~~ adjusting the information of channel estimation according to given

information of time delay and the past information of channel estimation to obtain adjusted

information of channel estimation; and

~~(a4) step of~~ accumulating the adjusted information of channel estimation as

the information of channel state for a predetermined interval;

~~(b) step includes:~~

~~(b1) step of~~ the generating the feedback information includes generating K*N

transmission weights based on the adjusted information of channel estimation;

~~(c) step includes:~~

~~(c1) step of~~ the sending the feedback information includes sending the

transmission weights as the feedback information to the transmitter through the feedback

path; and

~~(d) step includes:~~

~~(d1) step of~~ the processing the feedback information includes accumulating the

transmission weights as the processed feedback information for a predetermined interval.

Claim 29 (Currently Amended): A method of receiving and reproducing MIMO transmission signal according to claim 23, further comprising ~~the step of~~:

~~(j) step of~~ estimating a condition of received power by using <u>the</u> information of channel estimation, received signals received by ~~#1 to #L~~ <u>L</u> antennas and information of a known symbol; ~~and~~

~~the method, in which~~

~~(a) step includes:~~

~~(a1) step of estimating state of each communication channel from the received signals received by the #1 to #L~~ <u>L</u> ~~antennas to obtain the information of channel estimation;~~

~~(a2) step of~~ <u>wherein the estimating a state of each communication channel</u> <u>includes:</u>

storing past information of channel estimation which has been obtained ~~by (a1) step~~;

~~(a3) step of~~ adjusting the information of channel estimation according to given information of time delay and the <u>stored</u> past information of channel estimation ~~stored by (a2) step~~; and

~~(a4) step of~~ accumulating the adjusted information of channel estimation as the information of channel state for a predetermined interval;

~~(b) step includes:~~

~~(b1) step of~~ <u>the generating the feedback information includes</u> generating K*N transmission weights based on the adjusted information of channel estimation;

~~(c) step includes:~~

~~(c1) step of~~ the sending the feedback information includes sending the

transmission weights as the feedback information to the transmitter through the feedback

path;

~~(d) step includes:~~

~~(d1) step of~~ the processing the feedback information includes accumulating the

transmission weights as the processed feedback information for a predetermined interval; and

~~(e) step includes:~~

~~(e1) step of~~ the generating K*L proper reception weights includes:

generating K*L first reception weights by using the adjusted information of

channel estimation and processed feedback information;

~~(e2) step of~~ generating K*L second reception weights by using the information

of channel state and processed feedback information;

~~(e3) step of~~ estimating a transmission quality according to the first reception

weights, second reception weights, processed feedback information, adjusted information of

channel estimation and condition of received power; and

~~(e4) step of~~ selecting reception weights to be used as the proper reception

weights from the first or the second reception weights.

Claim 30 (Currently Amended): A method of receiving and reproducing MIMO

transmission signal according to claim 23, further comprising ~~the step of~~:

~~(j) step of~~ estimating a condition of received power by using the information of

channel estimation, received signals received by ~~#1 to #L~~ L antennas and information of a
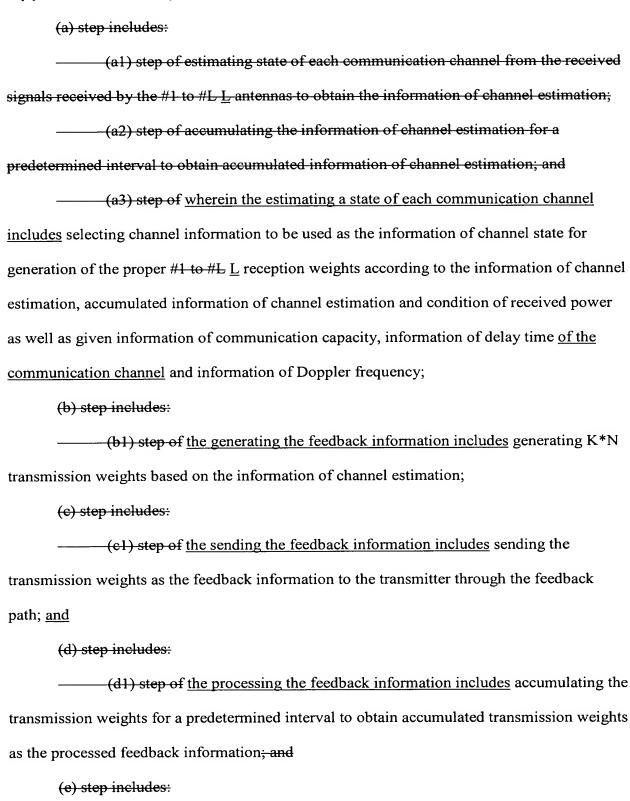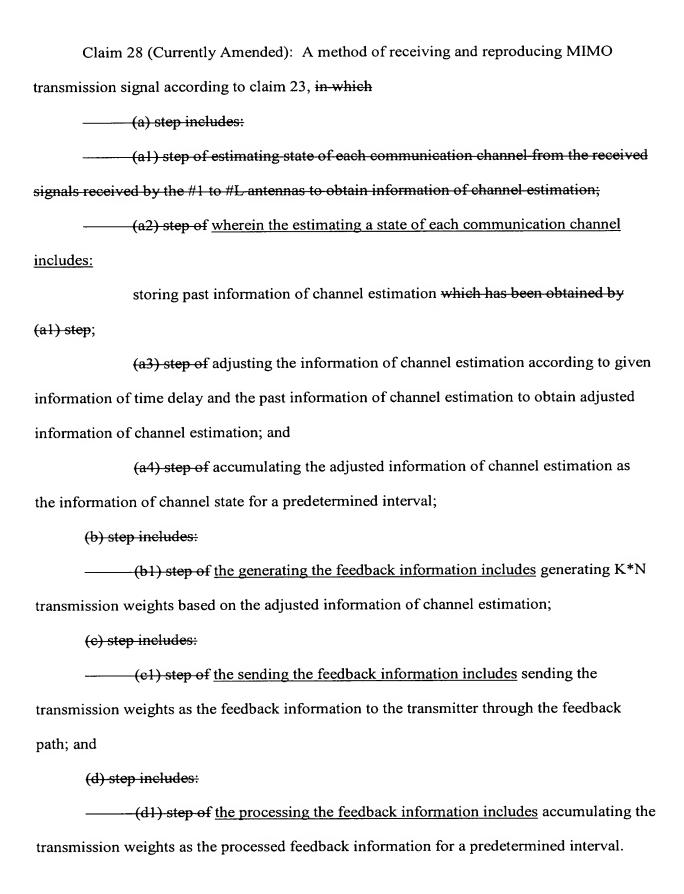
known symbol; ~~and~~

~~the method, in which~~

~~(a) step includes:~~

~~(a1) step of estimating state of each communication channel from the received signals received by the #1 to #L~~ L antennas to obtain the information of channel estimation;

~~(a2) step of~~ wherein the estimating a state of each communication channel includes:

storing past information of channel estimation which has been obtained ~~by (a1) step~~;

~~(a3) step of~~ adjusting the information of channel estimation according to given information of time delay and the stored past information of channel estimation ~~stored by (a2) step~~ to obtain adjusted information of channel estimation;

~~(a4) step of~~ accumulating the adjusted information of channel estimation for a predetermined interval; and

~~(a5) step of~~ selecting channel information as the information of channel state to be used for generation of the proper ~~#1 to #L~~ L reception weights according to the adjusted information of channel estimation, adjusted and accumulated information of channel estimation and condition of received power as well as given information of communication capacity, information of delay time of the communication channel and information of Doppler frequency;

~~(b) step includes:~~

~~(b1) step of~~ the generating the feedback information includes generating K*N transmission weights based on the adjusted information of channel estimation;

~~(c) step includes:~~

~~(c1) step of~~ the sending the feedback information includes sending the transmission weights as the feedback information to the transmitter through the feedback path; and

~~(d) step includes:~~

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~~(d1) step of~~ <u>the processing the feedback information includes</u> accumulating the

transmission weights as the processed feedback information for a predetermined interval.

Claims 31-32 (Canceled).

Claim 33 (Currently Amended): A method of receiving and reproducing MIMO

transmission signal comprising ~~the steps of~~:

~~(a) step of~~ generating primitive feedback information from received ~~#1 to #L~~ <u>L</u>

substreams received by ~~#1 to #L~~ <u>L</u> antennas of a receiver;

~~(b) step of~~ adjusting the primitive feedback information to obtain feedback

information;

~~(c) step of~~ sending the feedback information to a transmitter through a feedback path;

~~(d) step of~~ compensating feedback-delay for the feedback information<u>;</u>

<u>accumulating the feedback information for a predetermined interval</u>;

~~(e) step of~~ generating K*L proper reception weights by using the feedback-delay

compensated feedback information;

~~(f) step of~~ multiplying the received ~~#1 to #L~~ <u>L</u> substreams of respective ~~#1 to #K~~ <u>K</u>

signal streams by the proper ~~#1 to #L~~ <u>L</u> reception weights, respectively;

~~(g) step of~~ composing the ~~#1 to #L~~ <u>L</u> weighted substreams to obtain respective

composed ~~#1 to #K~~ <u>K</u> signal streams;

~~(h) step of~~ demodulating the composed ~~#1 to #K~~ <u>K</u> signal streams, respectively; and

~~(i) step of~~ combining the demodulated K signal streams to reproduce an original

transmission signal.

Claim 34 (Currently Amended): A method of receiving and reproducing MIMO

transmission signal according to claim 33, ~~in which~~

~~(a) step includes:~~

~~(a1) step of~~ the generating primitive feedback information includes estimating

a state of each communication channel from the received signals received by the ~~#1 to #L~~ L

antennas to obtain information of channel estimation as the primitive feedback information;

~~(b) step includes:~~

~~(b1) step of~~ the adjusting the primitive feedback information includes making

the primitive feedback information itself as the feedback information;

~~(d) step includes:~~

~~(d1) step of~~ the compensating feedback-delay includes:

accumulating the feedback information for a predetermined interval; and

~~(d2) step of~~ generating K*N receiver-side transmission weights as the

feedback-delay compensated feedback information based on the accumulated feedback

information ~~by (d1) step~~; and

~~(e) step includes:~~

~~(e1) step of~~ the generating K*L proper reception weights [[by]] is performed

by using the accumulated feedback information and feedback-delay compensated feedback

information.

Claim 35 (Currently Amended): A method of receiving and reproducing MIMO

transmission signal according to claim 33, further comprising:

~~(j) step of~~ estimating a condition of received power by using the information of

channel estimation, received signals received by the ~~#1 to #L~~ L antennas and information of a

known symbol; and

~~the method, in which~~

~~(a) step includes:~~

~~(a1) step of~~ the generating primitive feedback information includes estimating

a state of each communication channel from the received signals received by the ~~#1 to #L~~ L

antennas to obtain the information of channel estimation as the primitive feedback

information;

~~(b) step includes:~~

~~(b1) step of~~ the adjusting the primitive feedback information includes making

the primitive feedback information itself as the feedback information;

~~(d) step includes:~~

~~(d1) step of accumulating the feedback information for a~~

~~predetermined interval; and~~

~~(d2) step of~~ the compensating feedback-delay includes generating K*N

receiver-side transmission weights as the feedback-delay compensated feedback information

based on the accumulated feedback information ~~by (d1) step~~; and

~~(e) step includes:~~

~~(e1) step of~~ the generating K*L proper reception weights includes:

generating K*L first reception weights by using the information of channel estimation

and feedback-delay compensated feedback information;

~~(e2) step of~~ generating K*L second reception weights by using the accumulated

feedback information ~~by (d1) step~~ and receiver-side transmission weights ~~obtained by (e1)~~

~~step~~;

~~(e3) step of~~ estimating a transmission quality according to the first reception weights,

second reception weights, receiver-side transmission weights, information of channel

estimation and condition of received power; and

(e4) step of selecting the proper reception weights from the first or second reception

weights according to the transmission quality.

Claim 36 (Currently Amended): A method of receiving and reproducing MIMO

transmission signal according to claim 33, further comprising:

(j) step of estimating a condition of received power by using the information of

channel estimation, received signals received by the #1 to #L L antennas and information of a

known symbol; and

the method, in which

(a) step includes:

(a1) step of the generating the primitive feedback information includes

estimating a state of each communication channel from the received signals received by the

#1 to #L L antennas to obtain the information of channel estimation as the primitive feedback

information;

(b) step includes:

(b1) step of wherein the adjusting the primitive feedback information includes

making the primitive feedback information itself as the feedback information;

(d) step includes:

(d1) step of the compensating feedback-delay includes:

accumulating the feedback information for a predetermined interval; and

(d2) step of generating K*N receiver-side transmission weights as the

feedback-delay compensated feedback information based on the accumulated feedback

information; and

(e) step includes:

(e1) step of the generating K*L proper reception weights includes:

selecting channel information to be used for generation of K*L proper reception weights according to the primitive feedback information, accumulated feedback information and condition of received power as well as given information of communication capacity, information of delay time and information of Doppler frequency; and

(e2) step of generating K*L proper reception weights by using the selected channel information selected at (e1) step and the feedback-delay compensated feedback information.

Claim 37 (Currently Amended): A method of receiving and reproducing MIMO transmission signal according to claim 33, in which

(a) step includes:

———(a1) step of wherein the generating primitive feedback information includes estimating a state of each communication channel from the received signals received by the #1 to #L L antennas and outputting information of channel estimation as the primitive feedback information;

(b) step includes:

———(b1) step of the adjusting the primitive feedback information includes:

storing past information of channel estimation which has been outputted by (a1) step;

(b2) step of adjusting the information of channel estimation according to given information of time delay and the stored past information of channel estimation stored at (b1) step;

(c) step includes:

~~(c1) step of~~ the sending the feedback information includes sending the adjusted information of channel estimation as the feedback information to the transmitter through the feedback path; and

~~(d) step includes:~~

~~(d1) step of~~ the compensating feedback-delay includes:

accumulating the adjusted information of channel estimation for a predetermined interval as accumulated feedback information;

~~(d2) step of~~ generating K*N receiver-side transmission weights based on the accumulated feedback information; and

~~(d3) step of~~ accumulating the receiver-side transmission weights for a predetermined interval as the feedback-delay compensated feedback information; and

~~(e) step includes:~~

~~(e1) step of~~ the generating K*L proper reception weights is performed by using the accumulated feedback information and the feedback-delay compensated feedback information.

Claim 38 (Currently Amended): A method of receiving and reproducing MIMO transmission signal according to claim 33, further comprising:

~~(j) step of~~ estimating a condition of received power by using the information of channel estimation, received signals received by the ~~#1 to #L~~ L antennas and information of a known symbol; ~~and~~

~~the method, in which~~

~~(a) step includes:~~

~~(a1) step of~~ the generating primitive feedback information includes estimating a state of each communication channel from the received signals received by the ~~#1 to #L~~ L

antennas to obtain the information of channel estimation as the primitive feedback

information;

~~(b) step includes:~~

——— ~~(b1) step of~~ the adjusting the primitive feedback information includes:

storing past information of channel estimation which has been obtained by ~~(a1) step~~;

and

~~(b2) step of~~ adjusting the information of channel estimation according to given

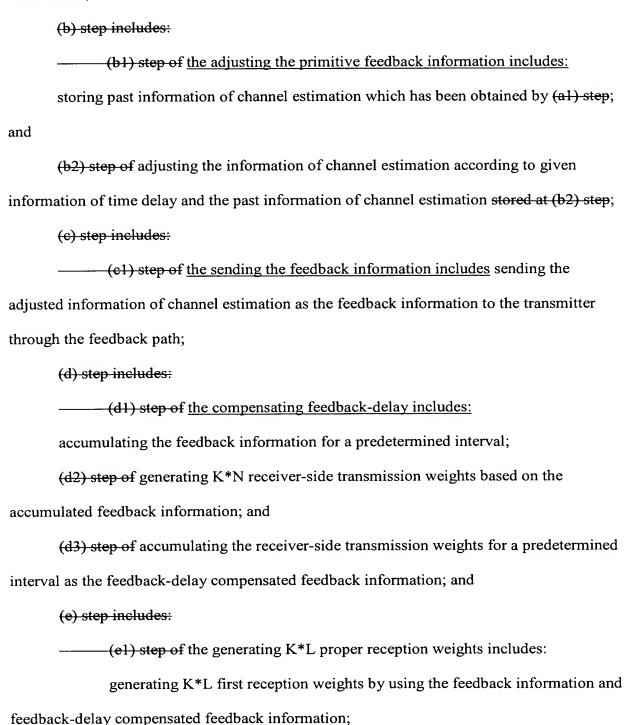information of time delay and the past information of channel estimation ~~stored at (b2) step~~;

~~(c) step includes:~~

——— ~~(c1) step of~~ the sending the feedback information includes sending the

adjusted information of channel estimation as the feedback information to the transmitter

through the feedback path;

~~(d) step includes:~~

——— ~~(d1) step of~~ the compensating feedback-delay includes:

accumulating the feedback information for a predetermined interval;

~~(d2) step of~~ generating $K*N$ receiver-side transmission weights based on the

accumulated feedback information; and

~~(d3) step of~~ accumulating the receiver-side transmission weights for a predetermined

interval as the feedback-delay compensated feedback information; and

~~(e) step includes:~~

——— ~~(e1) step of~~ the generating $K*L$ proper reception weights includes:

generating $K*L$ first reception weights by using the feedback information and

feedback-delay compensated feedback information;

(e2) step of generating K*L second reception weights by using the accumulated feedback information and the feedback-delay compensated feedback information; and

(e3) step of estimating a transmission quality according to the first reception weights, second reception weights, feedback-delay compensated feedback information, feedback information and condition of received power; and

(e4) step of selecting the proper reception weights from the first or second reception weights according to the transmission quality.

Claim 39 (Currently Amended): A method of receiving and reproducing MIMO transmission signal according to claim 33, further comprising:

(j) step of estimating a condition of received power by using the information of channel estimation, received signals received by the #1 to #L L antennas and information of a known symbol; and

the method, in which

(a) step includes:

(a1) step of the generating primitive feedback information includes estimating a state of each communication channel from the received signals received by the #1 to #L L antennas to obtain information of channel estimation as the primitive feedback information;

(b) step includes:

(b1) step of the adjusting the primitive feedback information includes:

storing past information of channel estimation which has been outputted at (a1) step;

(b2) step of adjusting the information of channel estimation according to given

information of time delay and the stored past information of channel estimation stored by

(b1) step;

(c) step includes:

(c1) step of the sending the feedback information includes sending the

adjusted information of channel estimation as the feedback information to the transmitter

through the feedback path;

(d) step includes:

(d1) step of the compensating feedback-delay includes:

accumulating the feedback information for a predetermined interval;

(d2) step of generating K*N receiver-side transmission weights based on the

accumulated feedback information; and

(d3) step of accumulating the receiver-side transmission weights for a

predetermined interval as the feedback-delay compensated feedback information; and

(e) step includes:

(e1) step of the generating K*L proper reception weights includes:

selecting channel information to be used for generation of K*L proper

reception weights according to the feedback information, accumulated feedback information

and condition of received power as well as given information of communication capacity,

information of delay time and information of Doppler frequency; and

(e2) step of generating K*L proper reception weights by using the selected

channel information and the feedback-delay compensated feedback information.

Claim 40 (Currently Amended): A method of receiving and reproducing MIMO

transmission signal according to claim 33, in which

~~(a) step includes:~~

~~(a1) step of~~ <u>wherein the generating primitive feedback information includes</u> estimating <u>a</u> state of each communication channel from the received signals received by the ~~#1 to #L~~ <u>L</u> antennas to obtain information of channel estimation as the primitive feedback information;

~~(b) step includes:~~

~~(b1) step of~~ the adjusting the primitive feedback information includes:

storing past information of channel estimation ~~which has been generated at (a1) step~~; and

~~(b2) step of~~ adjusting the information of channel estimation according to the <u>stored</u> past information of channel estimation ~~stored at (b1) step~~ and given information of time delay;

~~(c) step includes:~~

~~(c1) step of~~ <u>the sending the feedback information includes</u> sending the adjusted channel information as the feedback information to the transmitter through the feedback path;

~~(d) step includes:~~

~~(d1) step of~~ <u>the compensating feeback-delay includes:</u>

accumulating the feedback information for a predetermined interval; and

~~(d2) step of~~ generating K*N receiver-side transmission weights as the feedback-delay compensated feedback information by using the accumulated feedback information; and

~~(e) step includes:~~

~~(e1) step of~~ the generating K*L proper reception weights is performed by using the primitive feedback information and the feedback-delay compensated feedback information.

Claims 41-42 (Canceled).